

INDUSTRIAL HEALTH—MEETING THE CHALLENGE*

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(RECEIVED FOR PUBLICATION JULY 24, 1958)

The modern industrial system had its origin in England just over 200 years ago. This period historically is referred to as the Industrial Revolution. It was marked by mechanical inventions in textile machinery, by advances in the manufacture of iron, and by the introduction of steam power. These, in turn, were the foundations of the factory system.

In 1784 at a cotton mill at Radcliffe, near Manchester, an epidemic of malignant fever affected the operatives and spread to the surrounding population. The situation became serious and the local justices invited Dr. Thomas Percival, a leading local physician, to investigate the nature and circumstances of the outbreak. With his colleagues and leading citizens he formed the Manchester Board of Health. The Board, through authoritative reports, made recommendations for the control of such epidemics by the establishment of isolation hospitals. They also urged the need for the improvement of environmental conditions in mills and factories and for the diminution of working hours, especially for children and women. In pursuance of these objects the Government in 1802 passed the Health and Morals of Apprentices Act. This was the first Factory Act. Since then factory legislation has been greatly extended and is the basis of statutory supervision of factories and factory workers under the inspector of factories. The development of this supervision is traced with special reference to the work of the certifying surgeons, now the appointed factory doctors, and the medical inspectors. Concurrently, public health education and workmen's compensation were advanced through legislation. Since 1935 voluntary medical services have been developed in industry. These services have not been restricted to the observance of the minimum standards prescribed by statute and so have been able to pioneer advances directed to the promotion of safety, health, and welfare in factories and other places of employment.

Radcliffe, Percival, and steam power are recognized as the growing points of the challenge to health by the Industrial Revolution. The means whereby the challenge was met are discussed.

Towards the end of the nineteenth century scientists increasingly concentrated their studies on the elements. This culminated in the isolation of the atom. During the last 10 years atomic power has become a reality and the foundation of the second Industrial Revolution. While the potential hazards of ionizing radiations had long been known and proved at Hiroshima, the inherent dangers for the general population only became impressed on the public mind by a breakdown at the Windscale No. 1 plutonium pile on October 10, 1957. Radio-active iodine escaped, contaminating the atmosphere as far afield as western Europe. A committee under the chairmanship of Sir Alexander Fleck was appointed to investigate the cause of the accident and its consequences and to make recommendations. The report, which laid special emphasis on safety and health, was published early in 1958. So by analogy, Windscale, Fleck, and atomic power are identified as the growing points of the challenge of the Second Industrial Revolution. How this challenge is to be met by doctors is discussed. It is submitted that the urgent need is to formulate now a basic philosophy for future development of industrial medicine. Continuation of the old order will not suffice: ideas must again become revolutionary. The responsibility for leadership rests on the Industrial Health Advisory Committee established in 1955 under the chairmanship of the Minister of Labour and National Service.

*The Mackenzie Industrial Health Lecture of the British Medical Association delivered on July 15, 1958, at the University of Nottingham during the annual provincial meeting of the Association of Industrial Medical Officers.

PART I

The modern industrial system had its origin in England just over 200 years ago. This period is often indicted as among the darkest chapters in our social history, and in support of this charge contemporary records and documents provide ample evidence. But the suffering of young children and women induced by excessive labour, contagious and infectious diseases caused by unwholesome and insanitary conditions, and injury and deformity arising out of accidents due to unguarded machinery, did not pass unheeded. They presented an unremitting, inexorable challenge, a challenge which was met progressively by a system of inspection and supervision, under the force of law, directed towards the welfare, health, and safety of the factory worker. In this beneficent care of industrial communities we were pioneers. Since then we have remained in the forefront of thought and the advancement of knowledge in this field, though in practice we may have been surpassed by other countries. Nevertheless I am convinced that our present code of social legislation, which derived from these early tentative steps, represents the highest conception in the world to-day. Now on the threshold of the Second Industrial Revolution a new challenge, no less compelling than the first, confronts us, but:

"Old England still throbs with the muffled fire
Of a Past she can never forget:
And again shall she banner the world up higher:
For there's life in the Old Land yet."

The change from the domestic system to the factory system of manufacture and trade, which occurred in the eighteenth century, is generally referred to as the Industrial Revolution. That the change was violent is starkly expressed by Toynbee in his comment "the population were torn up by the roots". The Revolution developed from a series of mechanical inventions commencing with Kay's fly shuttle in 1733 and culminating with Cartwright's power loom in 1785. While the new machines completely altered the traditional methods of cotton manufacture they did not of themselves constitute a revolution. This derived from two associated contemporaneous advances. The first was in 1760 when Dr. John Roebuck, a medical man, at Carron Ironworks near Falkirk in Scotland, succeeded in producing malleable iron by smelting with pit-coal. The second was nine years later in 1769 when James Watt, working as a mathematical instrument maker in the University of Glasgow, patented the condensing steam engine. A revolution in power resulted from the use of iron machines driven by steam. At first the power was applied as a pumping engine in the Cornish tin-mines but in 1785 Boulton

and Watt, in partnership at Soho, Birmingham, made an engine for a cotton mill at Papplewick, near Nottingham. This was the critical advance, an engine which could drive machinery of all kinds. But steam could only be generated in a fixed spot and the power distributed over a small area. Consequently it was necessary to herd the workpeople close together in one building and those who, like the parish apprentices, had no homes, lived on the premises. As smallpox, typhus, typhoid, cholera, and other dysenteric diseases were endemic in England at this period, it was no accident that these factory communities were ravaged by disease. Epidemics were common and it was inevitable that sooner or later one of these would break the factory bounds and involve the whole surrounding population. So it happened in 1784 at a mill owned by Sir Robert Peel (the elder) at Radcliffe near Manchester.* In a Short Essay written for the Service of the Proprietors of Cotton-Mills and the Persons employed in Them (anonymous: Manchester, 1784) it is recorded that:

"It is a well-known fact that there has been a contagious disorder in a cotton mill in the neighbourhood of Manchester, which has destroyed many persons, and endangered the lives of more."

"With respect to the nature of the disease, it was a malignant fever . . . it generally ran through whole families, equally affecting people of all ages, but most fatal to the men . . . and it was similar to the fevers that frequently rage in jails, ships and hospitals."

The outbreak of fever involved the whole locality and from contemporary reports it was particularly widespread and virulent in Salford. The local justices, compelled to face the challenge, invited Dr. Thomas Percival, a Manchester physician, to investigate the nature and the circumstances of the outbreak. He reported that the epidemic was due to overwork for inordinately long hours, poor food, wretched clothing, bad ventilation, and overcrowding in insanitary houses and factories, especially by children. Percival continued his enquiries, enlisting the help of a very able young colleague, Dr. John Ferriar (Greenwood, 1948). With leading local citizens and physicians they formed the Manchester Board of Health (1805). At the first meeting held at the Bridgewater Arms Inn, Manchester, under the chairmanship of T. B. Bayley, Esq., on January 7, 1796, Percival defined the objects of the Board as threefold:

- (1) To obviate the generation of diseases.
- (2) To prevent the spreading of contagion.
- (3) To shorten the duration of existing diseases, and to mitigate their evils, by affording the necessary aids and comforts to those who labour under them.

*A reprint of the original report by Dr. Thomas Percival and colleagues 1784, is published on page 68 of this issue.

Ferriar in turn enunciated a fundamental proposition:

"The safety of the rich is intimately connected with the welfare of the poor, and a minute and constant attention to their want is not less an act of self-preservation than of virtue."

Percival submitted five resolutions for deliberation by the members of the Board of Health in formulating preventive measures. The first four embrace the purposes defined in the objects of the Board. This is the final item:

"From the excellent regulations which subsist in several cotton factories, it appears that many of these evils may, in a considerable degree, be obviated; we are therefore warranted by experience and are assured we shall have the support of the liberal proprietors of these factories, in proposing an application for Parliamentary aid (if other methods appear not likely to effect the purpose), to establish a general system of laws for the wise, humane, and equal government of all such works."

This was the first proposal for an organized attack on vicious conditions in mills and factories and against bad employers. Percival, however, it will be noted, mentions good employers, who maintained satisfactory conditions of labour and so provided a model. The magistrates at Manchester immediately took action and were supported by their colleagues in other large factory areas. In 1802 the Government, faced by this situation, passed an Act for the Preservation of the Health and Morals of Apprentices and Others employed in Cotton and Other Mills and Cotton and Other Factories.

In practice the Act proved quite ineffective but it represented an important advance, namely, the right of the Legislature to interfere in the regulation of the conditions of industrial employment. During the ensuing 30 years practically no progress was made, but meanwhile the damning evidence against factory conditions was relentlessly accumulating.

Ultimately, a Select Committee under the chairmanship of Michael Sadler, a flax mill owner and Member of Parliament for Leeds, was set up in 1831 to enquire into the conditions of children in factories. The Report (1831), one of the most human documents of all time, was rejected by Parliament as a basis for new legislation. Two years later, however, a Royal Commission on the Employment of Children in Factories was appointed. The Commissioners, who included leading physicians, visited all factory areas to obtain evidence at first-hand. Dr. Charles Loudon, medical commissioner for the North Eastern District, concluded his Report thus:

"I would compel the occupier of every mill to appoint a medical officer to his or her factory, who would examine every child before admission, to see whether its constitution was such as to bear the work;

and this medical practitioner should visit the mill at least once a week, or oftener, to ascertain the health of the operatives generally; to this person I would consign the hygienic as well as the medical care of the factory. Besides attending to the sick of all classes in and out of the mill, it would be his business to see that the building was thoroughly washed with quicklime and water at certain periods of the year; that the windows were properly constructed to admit fresh air; the drains and water closets in proper order; the floors kept properly clean, and the machinery carefully boxed off."

Dr. Williamson of Leeds advised that "if possible every mill should be provided with baths for both sexes".

Following a Bill introduced by Lord Althorp, Parliament, on August 29, 1833, passed an Act to Regulate the Labour of Children and Young Persons in the Mills and Factories of the United Kingdom (Factory Inquiry Commission, 1833). The employment of children under the age of 9 years was prohibited and persons under 18 were not to be allowed to work at night or for more than 12 hours a day, excluding meal-times, in mills or factories. Furthermore children were not to be employed without the certificate of a surgeon as to "strength and appearance".

As proved by subsequent events section 17 was the keystone, namely, "Four persons to be appointed to be Inspectors of Factories and Places where the labour of Children and Young Persons under Eighteen years of Age is employed".

Section 20 which required children in factories to attend school was no less important.

Robert Saunders, Robert Rickards, Thomas Howell, and Leonard Horner were appointed to be the first four district inspectors and later they were assisted by superintendent inspectors. All four immediately entered on their onerous and difficult duties with great zeal, indeed with a missionary spirit. To ensure uniformity of practice and administration they met, as prescribed, in conference every six months and each prepared a quarterly report on his work. These reports are very full and informative and remarkable for their critical outlook and constructive practical recommendations for improvement. The inspectors emerge as men of integrity and great moral courage.

Rickards, whose district comprised Lancashire and Yorkshire, resigned on account of illness in 1836. Horner, who had been in charge of Scotland and Ireland, was transferred to succeed him. It is of interest to note that in his quarterly report dated September 20, 1836, he refers to "Mr. Baker, surgeon of Leeds, the factory superintendent in that division of my district". Before his appointment as a superintendent inspector, Robert Baker started

to practise as a doctor and Poor Law medical officer in Leeds in 1825, and so was a contemporary and neighbour of Charles Turner Thackrah.

The inspectors unanimously urged the extension of the Act to silk and other mills and factories. Leonard Horner was not only a distinguished scientist, a Fellow of the Royal Society, and of the Geological Society, of which he became president, but he was also a leading educationist. He regarded individual factory schools as inadequate and advocated that employers should combine to establish central or joint schools. In this advancement of child education he was strongly supported by Howell, who recorded that "in some small mills the master himself is frequently unable to read or write (in Wales he very often cannot even speak English)".

Saunders concentrated his attention on the surgeons' certificates of age. He was concerned to ensure their validity and prevent fraudulent use by employers and parents. To define criteria of the ordinary strength and appearance related to age he instituted an enquiry into physical measurements of children in various districts. When he sought to establish the development of teeth as a test of age for persons between 7 and 14 years of age he was opposed by many surgeons. He also foresaw the need to restrict the issue of certificates to specially appointed surgeons. This was his conclusion (Saunders, 1838):

"When medical gentlemen will faithfully and conscientiously perform their duty, I am convinced it would be impossible by any other means yet suggested to secure to the younger classes as effectually the protection extended by the Legislature."

Saunders' aim was achieved in 1844 by the passing of an Act to amend the laws relating to labour in factories. This Act empowered the inspectors to appoint in each district a sufficient number of persons practising surgery or medicine to be certifying surgeons to give surgical certificates of age. The examinations were restricted to them and were to be made at the factory. An added duty was to examine the causes and extent of accidents and to report thereon to the district inspector. These provisions marked the beginning of statutory medical services in factories. So after 60 years the challenge of Radcliffe was slowly but progressively being met in the cotton mills and factories. Meanwhile sanitary science under the leadership of Edwin Chadwick had proved a powerful ally, and through the care of water supplies, disposal of sewage, and the provision of isolation hospitals had begun to advance the public health. Concurrently, the education of children was extending in factory and national schools. In short, the foundations had been laid of

statutory medical supervision in factories, of public health, and of popular education.

The next phase, extending over nearly 50 years, was marked by see-saw amendment and consolidation of the system and its administration, including extension to all varieties of textile mills and factories and non-textile factories and workshops. The payment of compensation for accidents at work not only gave some financial relief to workmen and their dependants but assisted indirectly towards the prevention of mishaps. Parallel legislation, though delayed, developed for control of work in coal-mines. So far the challenge comprised adverse social conditions, community diseases and accidents. Finally a new problem, which had been increasingly recognized, thrust itself to the forefront: this was industrial or trade diseases.

Trade Diseases

From their intimate experience of workmen and workplaces the certifying surgeons made notable contributions in this field. Moreover, as the majority of the surgeons were local general practitioners they knew the suffering and tragic hardships which accompany chronic disease, disablement, and premature death. I can only cite briefly a few outstanding examples of these contributions.

Charles Purdon (1819-1882), certifying surgeon for the Belfast district, recorded the various affections of operatives in flax mills and linen factories. Mill fever he attributed to "the smell of oil along with vapour and heat of the room". His description of the clinical picture and course of asthma due to the inhalation of pounce, fine flax dust, is still unsurpassed. The condition, byssinosis, is nowadays more generally associated with work in cotton mills. Among other conditions which he noted in these workers was a peculiar eruption which attacked uncovered parts of the body. To this he gave the name lichen and remarked that he had never seen a case in an adult. He attributed this form of occupational dermatitis to the effect of flax water, which also caused onychia of the toes, a common complaint due to the custom of working barefoot.

William Francis Dearden (1863-1931), of whom it was said that he was "first of all a Lancashire man and then a doctor", devoted his life to the study of occupational hazards in the cotton industry. His observations were embodied in the Milroy Lectures delivered before the Royal College of Physicians of London in 1927, entitled "Health Hazards in the Cotton Industry". In turn he served as secretary and president of the Association of Certifying Factory Surgeons and he wrote several excellent

brochures on the functions of a factory medical service.

In the course of his practice as a certifying surgeon and consulting physician to the North Staffordshire Infirmary John Thomas Arlidge (1822-1899) devoted his life to the study of diseases, particularly chest diseases, of potters and colliers. His observations were embraced in the Milroy Lectures of 1889. These lectures were the foundation of his book on the "Hygiene, Diseases, and Mortality of Occupations", a work which will stand comparison with all similar works, past and present. Incidentally, it is of interest to note in passing the admirable contributions to industrial diseases made by a long succession of distinguished Milroy lecturers. I shall recall only two others, R. Prosser White (1915), of Wigan, the author of "Occupational Affections of the Skin", and Alexander Scott (1922), of Broxburn, another pioneer in the field of the dermatoses and skin cancers, particularly those associated with exposure to paraffin in the Scottish shale oil industry.

In 1898 Dr. Legge (later Sir Thomas Legge) was appointed to be the first medical inspector of factories. In conjunction with Dr. Oliver (later Sir Thomas Oliver) of Newcastle-upon-Tyne and Dr. Goadby (later Sir Kenneth Goadby) he laid the foundation of the systematic study and prevention of occupational diseases as described in his book "Industrial Maladies" (1934). His name will always be linked with the control of anthrax and lead poisoning. The branch of the factory inspectorate which he initiated has added greatly to our knowledge of industrial diseases: Collis, Middleton, and Merewether in the field of dust diseases of the lungs, Henry on occupational skin cancer, and Ethel Browning on chemical intoxications. The present members of the staff have also made notable contributions and with their colleagues are worthily maintaining a great tradition.

Dr. John C. Bridge (1945), who succeeded Sir Thomas Legge on his resignation in 1926, initiated a new application of medicine to industry, namely, the modern system of medical supervision. The development of this owes much to the pioneer work of Dr. A. J. Amor and his colleagues at the Ministry of Supply during the Second World War and to such outstanding medical officers in private industry as Dr. Leonard Lockhart, Professor R. E. Lane, Dr. Donald Stewart, and Dr. Austin Eagger. The impact of all these contributions is variously reflected in the Tomlinson (Cmd. 6415, 1943), Gowers (Cmd. 7664, 1949), and Dale reports (Cmd. 8160, 1951).

Throughout this period of 60 years industrial diseases have been increasingly linked to problems of workmen's compensation. Pneumoconiosis has

dominated this aspect and none has served better in the study of the hazard in specific occupations, in the development of legislation and its administration than Dr. Charles L. Sutherland.

In this review I have concentrated on doctors and factories, but this does not signify that I underrate the great, in some respects greater, contributions of the social reformers, statesmen, administrators, farsighted employers, workers' leaders, and research workers. Nor am I unmindful of those who have concurrently so successfully promoted public health and the safety, health, and welfare of coal-miners. The story of the answer to the challenge of the Industrial Revolution is seen as one of halting progress, of practice trailing behind knowledge, of the inspectorate enforcing observance of minimum standards prescribed by law, while the voluntary system of medical supervision in private industry has experimented with new techniques and so paved the way to fresh advances. But not all private industry has participated nor is there any real evidence that all employers will do so either by invitation or recommendation. This leads me to the second part of my theme.

PART II

While social reformers, legislators, and administrators, lay and medical, were striving to advance the safety, health, and welfare of workers in factories and mines, almost unperceived by them chemists and physicists were more and more speculating on the genesis of the elements. In 1888 Sir William Crookes spoke of "an infinite number of immeasurably small, ultimate, or rather ultimatissime particles gradually accreting out of the formless mist, and moving with inconceivable velocity in all directions". In the light of current knowledge we may aptly quote:

"Often do the spirits
Of great events stride on before the events.
And in to-day already walks to-morrow."

I am not competent to describe the work of such notable scientists as Planck, Einstein, the Curies, Rutherford, and Bohr, which led to the discovery of atomic power and its application to peaceful industrial processes. Over many years electricity generated by coal and water power had steadily increased mechanization in industries but the advent of atomic power signifies sudden and violent changes in methods of work and production. Indeed so great, in fact and in potential, is this change that it represents a second Industrial Revolution.

The dangers of ionizing radiations, well known to medical men often from bitter personal experience, became generally known after Hiroshima. Not

unnaturally, increased industrial use caused widespread apprehension. Meticulous precautions were taken to safeguard the workers employed in atomic plants. The cost of absolute protection, if possible, was prohibitive and an international conference of experts recorded the need to accept a calculated risk. Public anxiety was largely latent until the radiation hazard broke bounds. On October 10, 1957, due to a breakdown at the Windscale No. 1 plutonium pile, radio-active iodine escaped through the filters of the two 400-foot-high chimneys, contaminating the atmosphere and pastures over an area of nearly 200 square miles. Possible adverse effects on the local inhabitants were almost immediately suggested by the detection of a rising concentration of radio-active iodine in cow's milk.

The United Kingdom Atomic Energy Authority acted promptly by setting up an expert committee under the chairmanship of Sir Alexander Fleck to investigate the cause of the accident and its consequences. The Committee was also charged: "To review the organization within the Authority as a whole for control of health and safety and to make recommendations". History was repeating itself. In 1784 the growing points of the challenge were represented by steam, Radcliffe, and Percival; in 1957 by the atom, Windscale, and Fleck. On this occasion, however, circumstances are vastly different. In 1784 the challenge comprised the excessive labour of children and young persons for 60 hours a week or more; undernutrition and malnutrition; grossly insanitary conditions; acute infectious diseases and physical strain; and illiteracy. The workers had not combined in trade unions. By 1957 all these matters had been substantially remedied or at least ameliorated. By contrast the new challenge includes the ageing population and the elderly workman; the use of leisure associated with the 48-hour week diminishing to 40 hours; mental stress; maintenance and promotion of health; rehabilitation and resettlement of persons handicapped from any cause; and technical education. Trade unions are now among the most powerful organizations in the country. On the previous occasion there was no experience to guide the reformers. This time we cannot plead such handicap. How then do we view the new challenge and by what means shall we meet it?

The historical development of factory legislation proves that the foundations of the statutory system of inspection and supervision were substantially laid in the 10 years immediately following the first appointment of factory inspectors in 1833. The succeeding 100 years were marked by a tentative, halting extension of the system assisted by concurrent advances in public health. This signifies that over the next few years we must endeavour to envisage

the whole challenge which confronts us, so that we may establish a basic philosophy to meet it. The responsibility for leadership devolves on the Industrial Health Advisory Committee set up by the Minister of Labour and National Service in 1955. It is important that the Committee should recognize and accept this responsibility and that we should constantly press for practical results. A start has been made; the Halifax Report published in March, 1958, is the first fruit of their work.

I have already suggested that we are at the beginning of a second Industrial Revolution, which, like its predecessor, presents a challenge in the field of industrial health. Straightway I would underline that a gradual linear extension of the previous system will not suffice; we must again become revolutionary in our ideas.

Factory Inspectorate

The Factory Inspectorate has proved its worth and provides a sound foundation for future developments. Right from its inception it has constantly been argued that relative to the size and composition of industry the number of inspectors is inadequate. Recently there has been an increase but it is clear that the establishment, even if multiplied several times, would still not assure constant effective supervision of all places of employment. Perhaps the solution is a new strategy of inspection, whereby the available staff is deployed to greater advantage. One need is urgent and paramount, namely, laboratory facilities. The establishment of regional occupational hygiene units for the use of the inspectors and to provide a consultant service for private industry is long overdue. Moreover, the basis of such a development already exists in the Public Health Laboratory Service, which to a large extent has become redundant since the introduction of the National Health Service. This is an aspect of industrial health in which the local authority health services could contribute with advantage. Similar opportunity for cooperation exists in the provision of radiological facilities for the work of the medical inspectors.

The Appointed Factory Doctor

The appointment of the certifying surgeons in 1844 was the beginning of statutory medical services in industry. By reference to the work of a few I have sought to indicate the excellent contributions which they made to safety, health, and welfare in factories. However, as appears from reports of parliamentary proceedings, from evidence to committees and commissions and from comments in medical journals their work was frequently condemned as negative, narrow, and cursory. As an example the Editor of

the *Glasgow Medical Examiner* in June, 1869, described their work as "services wholly unworthy of being called professional". At this time an extension of the Factory Act was under consideration and the senior inspectors were Mr. Arthur Redgrave and Mr. Robert Baker. Redgrave was critical of the certifying surgeons and sought to abolish them but was opposed by Baker who, it will be recalled, had formerly practised as a doctor in Leeds. The *British Medical Journal* supported the surgeons; the *Lancet* was against them. Much of the criticism was justified and in a measure is still applicable. But the important point is that basically the fault did or does not lie in the surgeons but in the system which prescribes their duties. The doctors have always regarded the official scale of fees as inadequate and appropriate only to rapid cursory fulfilment of the prescribed duties.

Consideration of the work of the certifying surgeon, now appointed factory doctor, must include reference to the School Health and Youth Employment Services. The whole subject was carefully examined by a Departmental Committee, whose Report on Medical Examination of Young Persons for Factory Employment was published in 1924 (Cmd. 2135). The Committee made many recommendations, several of which have since been implemented. This was the principal recommendation which was printed in bold, heavy type:

"Local Authorities should at once be invited to submit schemes for taking over such examination and certification of young persons, and that the aim in view should be that if the voluntary trial made by Local Authorities proves successful, the transfer of the whole of this work should be ultimately effected by Order of the Departments concerned."

Now more than 30 years later this change has not been effected. I do not mean to signify that I agree with the recommendation but my purpose is to emphasize that this is an aspect of the system which demands urgent re-examination with a view to improvement and simplification of the medical supervision of young persons.

The Committee also recommended that the age for examination should be raised from 16 to 18 years. This has now been done, but the then Chief Inspector of Factories, Mr. Gerald (later Sir Gerald) Bellhouse, stated in a personal memorandum that he "was exceedingly doubtful as to the necessity for raising the age for examination".

Careful study of the Report makes it difficult to avoid the conclusion that a necessary advance was hindered by the rivalries and power complex which seem to afflict departments of state. However, the medical examination of young persons, whatever their occupation or place of employment, is a

fundamental element of the present challenge. It must be met effectively. Professor Lloyd Davies, while engaged as an industrial medical officer here in Nottingham, proved by his outstanding work what can be achieved in this vital area between school and early years of employment. Dr. Martin Herford (1957), an appointed factory doctor, by his own work, forthright criticisms and recommendations for improvement has tried to focus attention on the subject. More recently Lee (1958) has cast grave doubts on the effectiveness of routine examination of school children by the school health service. The fact which emerges is that the school medical officer and the appointed factory doctor are each shackled to a system in which there is not sufficient time for effective or satisfying work. It is little wonder that defects, often remediable, are overlooked. The truth is that the whole medical body is suffering from a creeping paralysis of good clinical work due to a progressive, often purposeless proliferation of routine examinations.

This is not the place to discuss new arrangements for the examination of school leavers and new entrants to employment. However, I have already indicated that the scheme should embrace all young persons and I would suggest that the appropriate place and time would seem to be at school, as close to the age of 15 as possible, that is while pupils are easily accessible to facilities for complete examination. This might be the critical step towards integrating the work of the appointed factory doctor and the school medical officer. It might also be the means of utilizing the services of a much larger number of general practitioners and establishing through these three groups under the direction of the medical inspectors a service for small factories, shops, offices, and other places of employment.

Medical Inspectorate

The scope, functions, and duties of the medical inspectors seem soundly based and Legge and his successors have, as I have mentioned, made notable contributions to industrial health, particularly in the field of occupational diseases. And this has been achieved in spite of the handicap of inadequate laboratory facilities for clinical and environmental investigations. There are two further matters which I wish to stress here. The first concerns nurses in industry, the backbone of most medical departments. In 1951 I ventured to advocate the appointment of nursing inspectors. At the I.L.O./W.H.O. seminar on the "Nurse in Industry" held last year in London this idea was discussed and supported. I hope that the Industrial Health Advisory Committee will give this matter careful consideration. Secondly,

the medical inspectors should conduct regular courses and conferences to advance and coordinate the work of the appointed factory doctors.

Voluntary Medical Services

In the future development of medical services in industry the Report of the Fleck Committee (Cmd. 342, 1958) is, I believe, the most significant document of our times. Admittedly, it was directed to the control of health and safety from the hazards of atomic energy but if we insist on construing it thus narrowly and fail to realize its wider connotation then we shall stand condemned by future generations. We shall have failed to meet the challenge of occupational health and safety and not only in our own country but throughout the world. We are our brothers' keepers.

The Fleck Committee in propounding their basic philosophy underlined that the special problems of atomic energy require that the preparation of codes of practice for design and operation should be the responsibility of specialized health and safety staff, and that attention should be given to standards of occupational and non-occupational exposure to radiation and to toxic materials associated with nuclear reactors, process plants, and laboratories. Among the important recommendations which they made are the building up of a supply of specialist medical staff for the control of health and safety and that a national training centre for health physics and nuclear safety should be established. The United Kingdom Atomic Energy Authority have already started to implement these recommendations. This scheme, suitably adapted, can be the prototype for all industries.

The difficulty of applying any scheme to the whole of the employed population is, as has so frequently been emphasized since the Dale Report, that industry is largely made up of small occupational groups. In the Halifax Report the Industrial Health Advisory Committee made this significant comment:

"The right plan would seem to be to proceed by stages. The first stage should be to approach the occupiers of those factories in Halifax where 250 or more workers are employed with a view to interesting them in the advantages of the provision or extension of medical and nursing services."

The Committee listed the main elements in such a service. This recommendation is a vital response to the present challenge. But recommendation is not enough; the legislature should forthwith announce their intention to require all units of this size to provide such a medical service. In Norway it has already been proved that this can be achieved on the basis of the attendance of a doctor for a minimum of one hour per week per 100 workers. The doctor,

I believe, should be appointed and paid by the employers for, as so admirably expressed by Duncan (1958), only thus shall we attain a "personally aimed service, flexible and not strangled by mere observance of minimum standards" and restricted to routine examinations. As in the past this free service will experiment and provide a pattern leading to progressive advance. And in such appointments the doctor need not fear insecurity; a nation-wide industrial medical service will give security and opportunities for promotion through freedom of choice of job. For many reasons it is clear that such extension cannot be imposed and enforced immediately. This is an advantage; indeed it is desirable that the effective date should be post-dated by at least one year.

Education and Training

The fixing of the appointed day well in advance is fundamental to enable doctors, who intend to seek appointments, to attend short courses of instruction in the principles and practice of industrial health. Indeed, it would be invaluable if it were made a condition that no doctor will be eligible for appointment, including that of appointed factory doctor, until he can produce evidence that he has attended such a course. The omission of such a recommendation was, in my opinion, a defect of the Halifax Report. Moreover, failure to realize this very need in the appointment of disablement resettlement officers has hindered the efficient operation of the Disabled Persons (Employment) Act since its enactment in 1944.

In March, 1957, the Joint I.L.O./W.H.O. Committee on Occupational Health published a report (Tech. Rep. Series No. 135, Geneva) on the training of doctors in occupational health and on the scope and organization of occupational health institutes. Despite the experiments of the Nuffield Foundation in this field over a period of 10 years, the faculties of medicine have so far failed to pronounce as a result of this experience on the place (if any) of departments of industrial health in the universities and associated medical schools. This situation, however, would not be a matter of serious concern if there was any real evidence that a patient's employment in relation to his physical and mental condition was being adequately dealt with in clinical teaching. Examiners for higher qualifications could make an immediate contribution through written, clinical, and oral questions.

The Medical Department in Industry

I do not propose to review the working of the medical department but there are a few matters to

which I should like to allude briefly. The department must recognize health education of both management and workers as a primary function. Management has a duty to understand the purpose of the department and to ensure that it is efficient. Shop stewards must assist more actively in enforcing on their members full compliance with all measures for safety, health, and welfare. Sir Thomas Legge may have been right in his assertion that the workman is naturally enough willing to do his share to protect himself; in the future he must do a great deal more than what he interprets as his share at present.

It is often argued that a firm has not sufficient work to employ a doctor fully or substantially part time. This attitude derives from a focus on accidents and sickness and without regard to prevention. I venture to submit that the most important item is to assure that the doctor has free time—time to think, study, review, and apply his experience gained in the surgery and on the plant. Only thus can he hope to diminish the number of patients and so have adequate time for proper investigation of each case, the basis of which is time to listen attentively and observe carefully. And let us recognize that the emergency treatment of casualties and occupational diseases is relatively unimportant, compared with the detection of minor deviations from health of body and the mental effects of stress not only in individuals but in the group, in which no demarcation can be made between the influence of work and other activities.

Cost of Industrial Health Service

Eight years have now elapsed (and the choice of "elapsed" is intentional) since the Dale Committee (Cmd. 8170, 1951) reported that:

"In our view it is desirable that there should eventually be some comprehensive provision for occupational health, covering not only industrial establishments of all kinds, both large and small, but also the non-industrial occupations . . . This, however, is a long-term view which cannot be made effective without much more experience to be gathered from future surveys and experiments."

This proviso about surveys and experiments was reasonable but there is a danger that it may become an alibi in defence of indecision and procrastination.

Even if this comprehensive provision for occupational health, complementary to the National Health Service, is desirable, it will be argued that at this period of financial stringency industry cannot afford it. Many more skilled than I have discussed the price of health and the cost of sickness. Still I would direct attention to current experience of the National Insurance and Industrial Injuries Funds as presented in the Annual Reports of the Ministry of Pensions

and National Insurance (H.M.S.O., London). In the years 1951-1952 contributions from employers and insured persons to these funds amounted to £447,506,000 and increased to £610,079,000 in 1955-1956. During these years the corresponding figures for sickness benefits were £63,301,000 and £99,642,000 and for industrial injuries £16,325,000 and £32,063,000. Even allowing for increased rates of benefits these figures represent substantially rising costs. Furthermore, the trend of claims, particularly for minor sickness and injuries, is progressively upwards. So far rising costs have been met by the simple device of increasing contributions but these are now at a level which hurts. It must also be remembered that the funds are supplemented by annual contributions from the Exchequer. In respect of the Industrial Injuries Fund this supplement rose from £6,039,000 in 1951-1952 to £8,100,000 in 1955-1956. These costs, reflected in increased contributions, will go on rising and steeply if, as experience proves, there is unemployment and industrial unrest. I believe medical supervision in industry to be a major constructive approach to health and consequent saving on sickness and injury benefits. But this is not the real issue, for as so cogently expressed by Herbert Spencer:

"The preservation of health is a duty. Few seem conscious that there is such a thing as physical morality."

Preservation is not enough, we have a duty to promote health. This has been named "positive health", a term which has been criticized because of lack of precise definition. I know of none better than the words of our Lord:

"I am come that they might have life and that they might have it more abundantly."

CONCLUSIONS

In the course of this lecture I have said many things which are heterodox; indeed to some of you rank heresy. If this is so then I may have excited you to thought and argument and that is the real purpose of education, the purpose to which James Mackenzie dedicated his life. From thought, progression is to study and so to knowledge and finally to action. Never before in history has the science of medicine given us so many tools with which to bring to all men new vigour and hope. The health of men at work is the challenge which confronts us to-day; and how we meet this challenge concerns not only our own people but all humanity.

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